

## **Mechanical, physical and thermal properties of sugar palm nanocellulose reinforced thermoplastic starch (TPS)/poly(lactic acid) (PLA) blend bionanocomposites**

### **ABSTRACT**

In this paper, sugar palm nanocellulose fibre-reinforced thermoplastic starch (TPS)/poly (lactic acid) (PLA) blend bionanocomposites were prepared using melt blending and compression moulding with different TPS concentrations (20%, 30%, 40%, 60%, and 80%) and constant sugar palm nanocellulose fibres (0.5%). The physical, mechanical, thermal, and water barrier properties were investigated. The SEM images indicated different TPS loading effects with the morphology of the blend bionanocomposites due to their immiscibility. A high content of TPS led to agglomeration, while a lower content resulted in the presence of cracks and voids. The 20% TPS loading reduced the tensile strength from 49.08 to 19.45 MPa and flexural strength from 79.60 to 35.38 MPa. The thermal stability of the blend bionanocomposites was reduced as the TPS loading increased. The thickness swelling, which corresponded to the water absorption, demonstrated an increasing trend with the increased addition of TPS loading.

**Keyword:** Mechanical properties; Poly (lactic acid) (PLA); Poly (lactic acid) (PLA) blend bionanocomposites; Sugar palm nanocellulose fibre; Thermoplastic sugar palm starch